

DESCRIPTION OF TWO NEW SPECIES OF FOSSIL TURTLES, FROM THE LANCE FORMATION OF WYO- MING.

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Among the fossil specimens obtained by the late J. B. Hatcher in the Lance formation of Wyoming, for the United States Geological Survey, were a number of extinct turtles. Two of these are found to represent undescribed species, and they form the subject of the present paper.

BAENA HAYI, new species.

Type.—No. 6728, U. S. N. M., consists of a nearly complete carapace and plastron. Portions of the posterior lateral margins are the only important parts missing. Collected by J. B. Hatcher in the year 1890.

Locality.—Lance Creek, Niobrara County (formerly a part of Converse County), Wyoming.

Horizon.—Lance formation, Upper Cretaceous or Lower Tertiary.

Two species, pertaining to the genus *Baena*, *B. hatcheri* Hay and *B. marshi* Hay, have been described from the Lance formation, and a third species is now recognized in the present specimen, for which the name *B. hayi* is proposed. It is named in honor of Dr. O. P. Hay, of the Carnegie Institution, in recognition of his valuable contributions to our knowledge of the fossil turtles of North America.

The type of the species is a very complete specimen, that may at once be distinguished from the other species of the genus by the great breadth of the shell as compared with its length. It is the only *Baena* known at the present time in which the breadth exceeds the length. The greatest length of the carapace in a straight line is 292 mm.; its width is at least 320 mm.; the height from the bottom of the plastron is 85 mm., but in life it was probably greater, as the plastron at the center is somewhat crushed in toward the carapace.

The greatest breadth of the carapace is behind the inguinal notches. The posterior border is unusually broad and the lateral portions but

little rounded, whereas in *B. hatcheri* it rounds rapidly. The median portion is broadly excavated. The anterior end is also rather broadly truncated. The nuchal region projects slightly beyond the general contour of the carapace. The hinder border lateral to the median emargination is scalloped as in the other species of the genus. Because of the missing portions of this border the number of these scallops can not be determined.

The course of only a few of the costal sutures can be determined; all others are obliterated through coossification. The sulci although shallowly impressed are quite clear. The ornamentation of the carapace consists of ridges and furrows. The former are short, sometimes straight, usually bent, or anastomosing. The general effect is much the same as the sculpture in *Theseclus insiliens* Hay, described as resembling "shagreened leather," though coarser in this specimen. A considerable area within the second vertebral scute has the surface smooth. The sculpture of the plastron is of the same general character as on the carapace but finer in its pattern.

The nuchal scute is pentagonal, wider than long, and bordered on either side by a small triangular first marginal, see plate 32. In this it resembles the nuchal region in *Baena riparia*, except in that species the nuchal is divided. The nuchal is 13 mm. long; a greatest width of 27 mm.; width of free border 16 mm. The second marginal is 27 mm. long on the free border; the third 28 mm.; the fourth and fifth 42 mm. each.

The vertebral scutes as in all Cretaceous Baenidae are wider than long. The sides of the first are parallel until they meet the marginal sulcus, then they turn in toward the center, thus making the scute six sided as in *B. antiqua* (Lambe). The sides of the succeeding vertebrals are but slightly bracket-shaped. Their principal dimensions will be found in the accompanying table:

Vertebral.	Length.	Width.
1	39	61
2	65	83
3	89	92
4	53	78
5	57	96

Within the area of the fifth vertebral there is a decided median longitudinal ridge, the only indication of a carina.

The costal scutes show nothing particularly characteristic.

The number of marginal scutes can not be determined. The first marginal extends back from the border only 9 mm., the second 20 mm., the fifth 33 mm., the last one 31 mm.

The plastron is relatively short with a narrow tapering anterior lobe and a wider truncated posterior lobe with slight emargination.

The total length is 253 mm. at the center. The posterior extremity ends 25 mm. anterior to the border of the carapace. The anterior end also falls within the border of the shell. The plastron at the center is angularly concave but I am inclined to the opinion that this has been brought about by postmortem causes. The anterior lobe is short and narrow, much as in *Baena callosa* Hay, the length being 63 mm.; the width at the base being 92 mm.; at the gular sulsus 44 mm. The free borders of the anterior lobe in section are rounded. The thickness is about 8 mm.

The width of the bridge 122 mm.

The posterior lobe is 72 mm. long; 120 mm. wide at the base; at the femoro-anal sulsus 89 mm. wide. The contours of the converging borders are well shown on plate 33. Immediately behind the inguinal notch the thickness is 15 mm.; near the posterior extremity 7 mm. The posterior end has a subacute border that is only slightly emarginated at the center.

There are distinct gulars and intergulars. The humero-pectoral sulsus crosses to the center about on the line joining the axillary notches. The intergulars meet on the median line a distance of 10 mm.; the gulars 12 mm. on the left side, 8 mm. on the right side; humerals about 38 mm.; pectorals 57 mm.; the anals 48 mm. The course of the femoral-abdominal sulsus pursues a very irregular course. The anal-femoral sulsus as in other species of *Baena* runs outward then backward and then outward to the border.

On the bridge there are four large inframarginals as shown on plate 33, resembling somewhat those of *B. hatcheri* Hay in outline and position.

The ventral area of the marginals is much greater than in any other species of the genus.

As mentioned above, *Baena hayi* is distinguished at once from all other species of the genus by the proportions of the carapace, it being the only one known in which the width exceeds the breadth. From *B. marshi* this species may be distinguished by having a sculptured carapace, and the wider marginal areas on the ventral surface. From *B. hatcheri* it differs in the contour of the shell, being short and truncated at both ends, whereas *B. hatcheri* is relatively long, with a somewhat pointed anterior end. The absence of supernumerary scutes lateral to the first vertebral also serves further to distinguish it from the latter species.

ASPIDERETES LANCENSIS, new species.

Type.—Cat. No. 6727, U.S.N.M., consists of a considerable portion of the carapace, lacking a portion of the anterior border, the ninth pair of costals, and the ends of the forward costals of the left side.

Only one small piece of the plastron present. Collected by J. B. Hatcher.

Locality.—Niobrara County (formerly a part of Converse County), Wyoming.

Horizon.—Lance formation, Upper Cretaceous or Lower Tertiary.

The carapace of the type-specimen is about the size of the type of *Aspideretes beecheri* Hay from the same formation, but specifically distinct as shown by differences in the surface sculpture and in the arrangement of the costal and neural bones at the posterior end of the carapace.

The carapace is nearly as broad as long, and if measurements were taken to the end of costal ribs the breadth would exceed the length. The length must have been close to 300 mm., the width about 295 mm. The shell is regularly convex from side to side.

The lateral borders are somewhat sinuous, the hinder border broadly truncated and without emargination.

The sculpture of the carapace consists of a network of rounded ridges inclosing irregularly rounded pits, usually without definite arrangement, though there is a tendency toward the outer ends of the median costals to dispose themselves in rows more or less parallel to the borders of the shell. This feature, however, is not so apparent as in *A. foveatus* (Leidy). The pits have concave bottoms, the walls rising gradually as in *A. foveatus*, but this feature would at once separate the present species from *A. beecheri*, which has the bottom of the pits flat, the walls rising abruptly. The tops of the ridges are always rounded in the present specimen, whereas in *A. foveatus* they are usually flat.

Toward the free edge the pits increase slightly in size; they are shallower and diminish in size toward the middle, with here and there small areas almost devoid of sculpture. Along the costal sutures the pits have a tendency to elongate antero-posteriorly. This feature is not constant, and where present it is always on the outer halves of the costals. A line 10 mm. long extends across 6 pits, and often 7 may be counted.

On the outer halves of the costals, posterior to the second, are seen a number of prominent grooves that run from the border inward and forward, diagonally across the longer axes of the costals. At first sight they call to mind the welts observed on the costals of certain species of the genus *Plastomenus*, but a close examination shows them to be channel-like. The prominence of these channels is brought about by the widening of the parallel ridges which inclose them. Thin cross ridges divide the channel up into various size pits, which are often subrectangular in form.

The character of these channel-like markings is best shown in fig. 1, plate 35.

There are seven neurals, the seventh reaching the eighth pair of costals, whereas in all other described species of the genus *Aspideretes*, and *Plastomenus* as well, they never pass beyond the seventh pair and often end with the sixth.

The first neural is octagonal, with the median anterior border notched for the preneural, which is missing in this specimen. The succeeding neurals are hexagonal, longer than wide, with the narrow end forward as usual in the species of this genus. The dimensions of the neurals will be found in the accompanying table.

Measurements of neurals.

No.	Length.	Width.
1	24	20
2	31	22
3	31	19
4	26	19
5	26	17
6	26e	13e
7	24e	13

e=estimated.

There are nine pairs of costal bones, the ninth pair being very small and are missing from the present specimen (plate 34, *c.* 9), but the sutural borders show clearly the presence of this supernumerary pair. The eighth and ninth pairs meet on the median line except on the antero-median part of the former where the seventh neural is slightly interposed between them. The eighth pair meets on the median line for a distance of 34 mm. The costal ribs project beyond the edge of the carapace. The sixth of the right side projects 22 mm. beyond the border and it lacks the tip. None of the others are so perfectly preserved. The ribs are moderately broad, but occupy less than half the width of the costal plate. Between the ribs the borders of the costals have a thickness of from 6 to 7 mm.; through the rib they are 10 mm. in thickness.

On the outer ends of costals three, four, and five the sculpture stops short of the edge leaving a narrow smooth border that reduces the thickness of the costal from 2 to 3 mm. less in thickness than the sculptured portions. See figure 1, plate 35.

The nuchal bone is represented by a small piece of the right end, which remains in position attached to the under side of the first costal, as shown in plate 34, *n.*

The plastron is represented by two small fragments, probably pertaining to the hyoplastron. These show a surface ornamentation quite distinct from that of the carapace. It is made up of a series of short, raised, vermiculate ridges with intervening furrows of varying

lengths and irregular direction, but seldom do they inclose pits. In a line 10 mm. long 8 to 10 ridges may be counted. The character of this sculpture is best shown in figure 2, plate 35.

Aspideretes lancensis is distinguished from all described species by the ornamentation of the carapace, the presence of nine costals, and by the fact that the seventh neural is in contact with the eighth pair of costals.

The notch on the median anterior end of the first neural shows that there was a preneural, which indicates at once that the specimen can not be assigned to the genus *Amyda*, but whether it should be referred to *Plastomenus* or to *Aspideretes* is not so clear. The absence of identifiable plastron bones makes it impossible to be sure of its generic affinities, but since the genus *Plastomenus* has not yet been recognized from the Lance formation I therefore refer it to the genus *Aspideretes*, until such time as the discovery of more perfect material will make it possible to definitely determine its generic designation.

EXPLANATION OF PLATES.

PLATE 32.

Superior view of the carapace of *Bacna hayi*. No. 6728, U.S.N.M. Type-specimen, one-third natural size.

PLATE 33.

Inferior view of the plastron of *Bacna hayi*. No. 6728, U.S.N.M. Type-specimen, one-third natural size.

PLATE 34.

Superior view of the carapace of *Aspideretes lancensis*. No. 6727, U.S.N.M. Type-specimen, one-third natural size. *c. 1*, *c. 8*, costal plates one and eight; *c. 9*, notch for the missing ninth costals; *n*, right end of the nuchal plate; *pn*, notch on end of the first neural for the reception of the preneural.

PLATE 35.

Fig. 1. Distal ends of third and fourth costals of *Aspideretes lancensis*. No. 6727, U.S.N.M. Type-specimen, natural size. Shows character of sculpture of the carapace.

Fig. 2. Fragment of plastral bone of above specimen. Shows character of the sculpture of the plastron. Natural size.